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Registered Patent Attorney

July 19, 1999

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Re: Patent Application for
Device for Enhancing Removal of Liquid from Fabric
Our File No. PHRPIC

Dear Commissioner:

I have enclosed for appropriate attention the above-referenced Patent Application as well as the applicable filing fee of $842.00.

Thank you for handling this matter.

Very truly yours,

Thompson E. Fehr

Thompson E. Fehr
Reg. No. 31353

TEF/msg

A

Express Mail Label No. EJ429149980US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Dan Haynie
Serial No.:
Filed:
For: Device for Enhancing Removal of Liquid from Fabric
Group Art Unit:
Examiner:
Attorney Docket No.: PHRPIC

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(c))--SMALL BUSINESS CONCERN

I hereby declare that I am an official of the small business concern empowered to act on behalf of the concern identified below:

Concept Cleaning Systems, Inc.
1530 North 1000 West
Logan, Utah 84321

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.1301-1305, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to, and remain with, the small business concern identified above with regard to the invention entitled Device for Enhancing Removal of Liquid from Fabric by inventor Dan Haynie described the specification filed herewith.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention is listed below; and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

NAME _____

ADDRESS _____

___ INDIVIDUAL ____ SMALL BUSINESS CONCERN

_____ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: Craig Donaldson

TITLE OF PERSON OTHER THAN OWNER: President

ADDRESS OF PERSON SIGNING: 1530 North 1000 West
Logan, Utah 84321

SIGNATURE Craig Donaldson Date: 7/6/99

Express Mail Label No. EJ429149980US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Dan Haynie
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Group Art Unit:
Examiner:
Attorney Docket No.: PHRPIC

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27(b))--INDEPENDENT INVENTOR

As a below-named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled Device for Enhancing Removal of Liquid from Fabric described in the specification filed herewith.

I have not assigned, granted, conveyed, or licensed and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

Concept Cleaning Systems, Inc.
1530 North 1000 West
Logan, Utah 84321

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Dan Haynie
Inventor

Signature of Inventor

Date: 7-6-99

July 6, 1999

Express Mail Label No.: EJ429149980US

PATENT

UNITED STATES PATENT APPLICATION

of

INVENTOR: DAN HAYNIE
A citizen of the United States
1058 East 2100 North
NORTH LOGAN, UTAH 84341

for

DEVICE FOR ENHANCING REMOVAL OF LIQUID FROM FABRIC

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a device for increasing the efficiency of a carpet-cleaning machine and other extraction machines in removing cleaning solution and other liquids from fabric, especially a carpet.

DESCRIPTION OF THE RELATED ART

Carpet-cleaning machines spray a cleaning solution onto a fabric carpet and then vacuum the solution from the carpet into the machine. Other extraction machines may spray a liquid onto a fabric or simply remove a pre-existing liquid from the fabric.

The inventor was unable to locate any prior art patent which dealt with increasing the volume of liquid which a carpet-cleaning or other extraction machine can remover from carpet or another fabric.

The closest invention appears to be the cleaning tool of United States Patent No. 4,270,238. According to lines 33 through 44 of column 2 in that patent:

"Two continuous rows of channel bristles are mounted on the one surface of the block assembly adjacent to its front and rear edges so that the distal ends of the bristles project outwardly from the one surface of the block assembly and contact the wall or ceiling to be cleaned during the cleaning operation.

"A plurality of nozzles are mounted on the one surface of the block assembly between the front and rear edges of the seembly and the adjacent rows of bristles and are used to uniformly wet all of the bristles in the rows of bristles with a cleaning fluid . . . ."

Line 62 of column 2 through line 14 of column 3 further provide:

"A pair of longitudinal slots are disposed in the one surface of the block assembly and are positioned equidistant about the central, transvers axis or centerline of the block assembly and midway between the continuous rows of bristles. The inner tapered ends of the slots communicate, via the interior of the wand, with a source of vacuum which causes air to be drawn into the slots during the cleaning operation. The shape of the slots is designed so that a relatively

high velocity flow of air, as compared with the velocity of the air flow in the remainder of the tool, will be drawn generally uniformly into and through the slots. This air flow causes the cleaning fluid, together with the dirt suspended therein, to be stripped from the surface of the wall or ceiling almost immediately after the cleaning fluid has been applied. The substantially instantaneous extraction or removal of the cleaning fluid prevents the evaporation or drying of the cleaning fluid on the surface and also eliminates the cause of unsightly streaking by preventing cleaning fluid from trickling or running down and across a dry portion of the wall. . . ."

And lines 51 through 60 in column 6 elaborate:

". . . The design of the grooves **88** and **90**, the apertures **92** and **94** and the slots **96** and **98** assures that when the vacuum source **22** is being operated, air will be drawn into and through the slots **96** and **98** and into the apertures **92** and **94** at a relatively high velocity, as compared with the velocity of the air flowing downstream of the slots. As seen in FIG. 3, the highest velocity air flow is achieved as the air passes through the apertures **92** and **94** because these apertures provide the greatest restriction to air flow in the tool **10**."

Additionally, lines 25 through 28 of column 3 indicate:

"A spray nozzle may be mounted on the block assembly for spraying cleaning fluid directly onto the wall or ceiling to be cleaned prior to the use of our improved cleaning tool . . . ."

But, although United States Patent No. 4,270,238 recognizes that increased air velocity can be achieved by restricting flow and that this can assist in cleaning, nothing in the device of that patent forcibly directs the cleaning fluid to the apertures, the bristles would preclude a deep penetration into fabric or carpet by the tool even if the tool were intended to be used on fabric or carpet, there is no recognition of maximizing the total power of extraction for the machine, and no consideration is given to reducing boundary layer drag in the slots and apertures.

Similarly, in its concept for the suction nozzle for a vacuum, United States Patent No. 2,219,802 recognizes, on lines 39 through 42 of column 2, "Inasmuch as opening **27** is smaller than opening **16**, a more concentrated flow of air is obtained, which is able to remove the thread." But the nozzle is designed neither to forcibly direct a fluid into the an opening or to permit deeper penetration into carpet. Moreover, again there is no recognition of maximizing the

total power of extraction for the machine, and no consideration is given to reducing boundary layer drag in the nozzle.

And even though the vacuum tool of United States Patent No. 1,601,774 has apertures, they are so numerous as essentially to avoid restricting the flow of air in order to increase air speed, there is no recognition of maximizing the total power of extraction for the machine, and no consideration is given to reducing boundary layer drag in the apertures. In fact, the immense number of apertures most likely increases boundary layer drag. Furthermore, because the element containing the apertures rolls, it would not forcibly direct a fluid into the apertures. Nor is there any indication in the patent that the design of the roller facilitates deeper penetration into carpet. In fact, it would appear that penetration into the carpet is not desired because the patent, in line 5 through line 9 of column 1, asserts, "It is one of the principal objects of my invention to provide a vacuum tool which will roll easily and smoothly over a carpet, rugh or the like without pulling up its threads or nap."

The suction-cleaning implement of United States Patent No. 3,708,824 has tubular projections which are intended to reach the bottom of a carpet while cleaning of the upper level of the carpet is to be achieved through apertures in the base from which the tubes extend downward. A slidable plate selects either the tubes or the apertures in the base through which to draw air. Nothing, however, suggests that the tubes, the apertures in the base, or apertures in the slidable plate restrict air flow and thereby increase velocity, there is no recognition of maximizing the total power of extraction for the machine, and no consideration is given to reducing boundary layer drag. Moreover, there is no indication that the tubes increase pressure that can be exerted by the implement in order to achieve deeper penetration. It appears that such penetration is accomplished solely through the vertical extension provided by the tubes because the only reference (lines 34 through 35 of column 4) to the means of penetration by the tubes (which are called "teeth") indicates that they "provide combing action . . . ."

And the apertures of plate **15** in United States Patent No. 1,016,435 merely equalize pressure (*See, e.g.*, lines 44 through 51 in the left column on page 4). The grill **104** for the suction device in United States Patent No. 4,391,017 is, according to lines 35 through 27 of column 4, ". . . to prevent the device from becoming clogged by solid debris and thus reducing

its effectiveness." And the circular or oval chambers in the adapter plate for the nozzle of United States Patent No. 4,677,705 create rotary air currents to facilitate the removal of dust particles from carpets. There is no indication that the inventions of any of these patents restricts air flow to affect speed, there is no recognition of maximizing the total power of extraction for the machine, no consideration is given to reducing boundary layer drag. Additionally, nothing suggests this invention could forcibly direct a liquid into a nozzle or aperture or aid a nozzle to penetrate into a carpet. In fact, lines 27 through 30 and 32 through 33 of column 2 in United States Patent No. 4,677,705 state, "The exterior surface of the adapter plate is smooth and slides easily over each surface to be cleaned, irrespectively of how rough the latter is. . . . The adapter plate is not pulled by suction into the pile of a carpet . . . ."

SUMMARY OF THE INVENTION

The present invention is a device for attachment to the bottom of a wand or other nozzle that is used to vacuum liquid, especially liquid cleaning solution, from fabric, such as a carpet.

Two mechanical concepts and two aerodynamic techniques have been employed to enhance the extraction of the liquid from the fabric.

First concerning the mechanical concepts, barriers are attached to the portion of the Enhancement Device that will contact the fabric so that such barriers, when force is applied to the Enhancement Device will extend farther into the fabric than any other portion of the Enhancement Device. These barriers can be oriented and shaped in any fashion that will push any liquid in the fabric toward extraction nozzles as the Enhancement Device is moved across the fabric, in a manner similar to the way that a snow plow pushes snow ahead and to the side of the plow.

Second concerning the mechanical concepts, since pressure is equal to force divided by the component of surface area that applies such force and that is perpendicular to the body to which force is applied, the pressure exerted by the Enhancement Device upon fabric is increased by decreasing the surface area of the enhancement Device that contacts the fabric.

The extraction nozzles are apertures in the only portion of the Enhancement Device, other than the barriers, that will, when the Enhancement Device is used, face and contact the fabric and are generally located between the barriers. The existence of such apertures, therefore, decreases the surface area of the Enhancement Device that will contact the fabric.

The fact that, when force is applied to the Enhancement Device, the barriers extend farther into the fabric than any other portion of the Enhancement Device is also employed to further increase the pressure that the Enhancement Device exerts, for a given force, against the fabric since such barriers are constructed to have only a small surface area which contacts the fabric generally perpendicularly to the original orientation of such fabric.

Thus, the existence of the apertures and the construction of the barriers combine to increase the pressure that is exerted against a fabric when a given force is applied to the Extraction Device and, therefore, to increase the penetration of the Extraction Device into the fabric. Such increased penetration enhances the removal of any liquid in the fabric.

The first aerodynamic technique is adjusting the total cross-sectional area of the extraction nozzles to increase, and preferably maximize, the mass of air that moves through the extraction nozzles per unit time. The total power of extraction produced by a vacuum motor varies with air speed and is maximized at the point where the curves plotted (versus air speed) for pressure, which decreases with increasing air speed, and for volume of air, which increases with increasing air speed, cross. Since, in accordance with the Bernoulli principle, air speed varies inversely with the cross-sectional area through which a fluid can flow, the maximum extraction power for a given vacuum motor can be achieved by selecting the appropriate total cross-sectional area of the extraction nozzles; and, logically, such extraction power increases the closer such total cross-sectional area approaches to the appropriate quantity.

The second aerodynamic technique is reducing, and preferably minimizing, the boundary layer drag in the extraction nozzles. This is accomplished by reducing, and preferably minimizing, the ratio of the total distance along the perimeters of the extraction nozzles to the total cross-sectional area of the extraction nozzles, which, consequentially, minimizes the surface of the extraction nozzles to which the stream of air is exposed.

Finally, the cross-sectional area of each of the extraction nozzles is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the extraction nozzles without clogging such nozzles.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the bottom of the base plate for the Enhancement Device.

Figure 2 depicts a preferred shape for the base plate and a barrier as viewed from either end.

Figure 3 illustrates the preferred shape for the base plate and barrier as seen either from in front or behind.

Figure 4 portrays an optional embodiment having the barrier behind the aperture.

Figure 5 combines the embodiments of Figure 1 and Figure 4 so that barriers are located both generally between the apertures and behind the apertures.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Device for Enhancing Removal of Liquid from Fabric can be constructed initially in a carpet-cleaning machine or other machine for extracting liquid from a fabric; alternatively, it can be attached to existing such machines.

The primary structure of the Enhancement Device is a base plate **1** having one or more apertures **2** which serve as extraction nozzles to remove liquid from a fabric when the Enhancement device has been built into or retrofitted on a vacuum machine, such as a carpet-cleaning machine.

Barriers **3** are attached to the bottom **4** of the base plate **1**, which is the portion of the base plate **1** that will face and contact the fabric, and are preferably an integral part of the base plate **1**. As discussed above, these barriers **3** can be oriented and shaped in any fashion that will force any liquid in the fabric toward the apertures **2** as the base plate **1** is moved across the fabric. For a machine that will generally be moved straight forward and straight reverse across a carpet, the barriers **3**, as viewed from below, preferably have a straight, elongated shape, as illustrated in Figure 1.

The barriers **3** are preferably generally located between apertures **2**, preferably between adjacent apertures **2**, as depicted in Figure 1.

The liquid tends to go laterally rather than further into the fabric for two reasons: (1) the fabric is denser under the barriers **3** because the barriers **3** are, in use, pressed against the fabric and (2) a vacuum is applied through the apertures **2**.

The construction of the barriers **3** is such that each barrier **3** has only a small surface area that will contact the fabric generally perpendicularly to the original orientation of such fabric. A preferred shape for a barrier **3**, as viewed from either end of the barrier **3**, to be used with a machine that will generally be moved straight forward and straight reverse across a fabric is a V shape which is preferably integrally formed in the base plate **1**, which is also preferably V shaped when viewed from either end, as shown in Figure 2. The view of this preferred shape for the barrier **3** and the base plate **1** from either in front of the base plate **1** or behind the base plate **1** is given in Figure 3.

Optionally, the barriers **3** can be located behind the apertures **2**, as portrayed in Figure 4. In such a case, a single barrier **3** preferably runs behind all the apertures **2**. Having a barrier **3** located behind the apertures **2**, with respect to the intended direction of movement for the base plate **1**, tends further to increase the probability that liquid will be drawn into the apertures **2** because an aperture **2** will not simply pass over the liquid; by the barrier **3** forcing the liquid to move with the aperture **2** as part of the process of forcing the liquid toward such aperture **2** the liquid will be retained for a longer period of time under the aperture **2** to which a vacuum is being applied.

A further optional embodiment, which is illustrated in Figure 5, has barriers **3** both generally between the apertures **2** and also behind the apertures **2**.

As discussed above, the existence of the apertures **2**; the fact that, when force is applied to the Enhancement Device, the barriers **3** extend farther into the fabric than any other portion of the Enhancement Device; and the construction of such barriers **3** to have only a small surface area which contacts the fabric generally perpendicularly to the original orientation of such fabric combine to decrease the surface areas of the Enhancement Device that will exert pressure on the fabric, *i.e.*, the barriers **3** and the base plate **1**, and thereby to increase the pressure and, consequently, the penetration of the barriers **3** and the base plate **1** achieved when a given force is applied to the Extraction Device. Such increased penetration of the base plate **1** enhances the removal of any liquid in the fabric.

The total cross-sectional area of the apertures **2** is selected to be that which, as explained above, increases, and preferably maximizes, the mass of air that moves through such apertures **2**; this is accomplished by selecting the total of the aperture size for all apertures **2** combined to create the speed of air through the apertures **2** that will increase, and preferably maximize, the extraction power for the vacuum with which the Enhancement Device is to be utilized. Additionally, the number and shape of the apertures **2** is selected to reduce boundary layer drag by reducing, and preferably minimizing, the ratio of the total distance along the perimeters of the apertures **2** to the total cross sectional area of such apertures **2**. This, as also explained above, minimizes the surface of the apertures **2** to which the stream of air is exposed.

Finally, again as discussed above, the cross-sectional area of the apertures **2** is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures **2** without clogging these apertures **2**. This is consistent with the other aerodynamic goals because, *e.g.*, the ratio of the total distance along the perimeters of the apertures **2** to the total cross-sectional area of such apertures **2**, when the apertures **2** are circles, is inversely proportional to the radius of such circles.

CLAIMS

I claim:

1. A device for enhancing removal of liquid from fabric, which comprises:

a base plate having one or more apertures to serve as extraction nozzles, wherein the total cross-sectional area of the apertures is selected to be that which will increase the extraction power for the vacuum motor with which said base plate is to be utilized.

2. The device for enhancing removal of liquid from fabric as recited in claim 1, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

3. The device for enhancing removal of liquid from fabric as recited in claim 1, wherein:

the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

4. The device for enhancing removal of liquid from fabric as recited in claim 3, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

5. A device for enhancing removal of liquid from fabric, which comprises:

a base plate having one or more apertures to serve as extraction nozzles, wherein the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

6. The device for enhancing removal of liquid from fabric as recited in claim 5, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

7. A device for enhancing removal of liquid from fabric, which comprises:

a base plate having one or more apertures to serve as extraction nozzles; and

one or more barriers attached to the bottom of said base plate to force any liquid in the fabric toward said apertures as said base plate is moved across the fabric.

8. The device for enhancing removal of liquid from fabric as recited in claim 7, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

9. The device for enhancing removal of liquid from fabric as recited in claim 7, wherein:

the total cross-sectional area of the apertures is selected to be that which will increase the extraction power for the vacuum motor with which said base plate is to be utilized.

10. The device for enhancing removal of liquid from fabric as recited in claim 9, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

11. The device for enhancing removal of liquid from fabric as recited in claim 9, wherein:

the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

12. The device for enhancing removal of liquid from fabric as recited in claim 11, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

13. The device for enhancing removal of liquid from fabric as recited in claim 11, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

14. The device for enhancing removal of liquid from fabric as recited in claim 13, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

15. The device for enhancing removal of liquid from fabric as recited in claim 9, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

16. The device for enhancing removal of liquid from fabric as recited in claim 15, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

17. The device for enhancing removal of liquid from fabric as recited in claim 7, wherein:

the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

18. The device for enhancing removal of liquid from fabric as recited in claim 17, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

19. The device for enhancing removal of liquid from fabric as recited in claim 17, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

20. The device for enhancing removal of liquid from fabric as recited in claim 19, wherein:

said barriers are so constructed that only a small surface area of said barrier contacts the fabric generally perpendicularly to the original orientation of such fabric.

21. A device for enhancing removal of liquid from fabric, which comprises:

a base plate having one or more apertures to serve as extraction nozzles; and

a means for forcing any liquid in the fabric toward said apertures as said base plate is moved across the fabric, said means for forcing being attached to the bottom of said base plate.

22. The device for enhancing removal of liquid from fabric as recited in claim 21, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

23. The device for enhancing removal of liquid from fabric as recited in claim 21, wherein:

the total cross-sectional area of the apertures is selected to be that which will increase the extraction power for the vacuum motor with which said base plate is to be utilized.

24. The device for enhancing removal of liquid from fabric as recited in claim 23, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

25. The device for enhancing removal of liquid from fabric as recited in claim 23, wherein:

the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

26. The device for enhancing removal of liquid from fabric as recited in claim 25, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

27. The device for enhancing removal of liquid from fabric as recited in claim 25, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

28. The device for enhancing removal of liquid from fabric as recited in claim 27, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

29. The device for enhancing removal of liquid from fabric as recited in claim 23, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

30. The device for enhancing removal of liquid from fabric as recited in claim 29, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

31. The device for enhancing removal of liquid from fabric as recited in claim 21, wherein:

the number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures.

32. The device for enhancing removal of liquid from fabric as recited in claim 31, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

33. The device for enhancing removal of liquid from fabric as recited in claim 31, wherein:

the cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures.

34. The device for enhancing removal of liquid from fabric as recited in claim 33, wherein:

said means for forcing includes a means for increasing the penetration of said base plate into the fabric.

35. A process for enhancing removal of liquid from fabric, which comprises:

applying a vacuum force to a base plate having one or more apertures to serve as extraction nozzles; and

forcing any liquid in the fabric toward one or more of the apertures in the base plate as a result of the movement of the base plate across the fabric.

36. The process for enhancing removal of liquid from fabric as recited in claim 35, further comprising:

increasing the penetration of the base plate into the fabric.

37. The process for enhancing removal of liquid from fabric as recited in claim 35, further comprising:

selecting the total cross-sectional area of the apertures to be that which will increase the extraction power for the vacuum motor with which the base plate is to be utilized.

38. The process for enhancing removal of liquid from fabric as recited in claim 37, further comprising:

increasing the penetration of the base plate into the fabric.

39. The process for enhancing removal of liquid from fabric as recited in claim 37, further comprising:

selecting the number and shape of the apertures to reduce the ratio of the total distance along all the perimenters of the apertures to the total cross-sectional area of the apertures.

40. The process for enhancing removal of liquid from fabric as recited in claim 39, further comprising:

increasing the penetration of the base plate into the fabric.

41. The process for enhancing removal of liquid from fabric as recited in claim 39, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

42. The process for enhancing removal of liquid from fabric as recited in claim 41, further comprising:

increasing the penetration of the base plate into the fabric.

43. The process for enhancing removal of liquid from fabric as recited in claim 37, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

44. The process for enhancing removal of liquid from fabric as recited in claim 43, further comprising:

increasing the penetration of the base plate into the fabric.

45. The process for enhancing removal of liquid from fabric as recited in claim 35, further comprising:

selecting the number and shape of the apertures to reduce the ratio of the total distance along all the perimenters of the apertures to the total cross-sectional area of the apertures.

46. The process for enhancing removal of liquid from fabric as recited in claim 45, further comprising:

increasing the penetration of the base plate into the fabric.

47. The process for enhancing removal of liquid from fabric as recited in claim 45, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

48. The process for enhancing removal of liquid from fabric as recited in claim 47, further comprising:

increasing the penetration of the base plate into the fabric.

49. A process for enhancing removal of liquid from fabric, which comprises:

applying a vacuum force to a base plate having one or more apertures to serve as extraction nozzles; and

selecting the total cross-sectional area of the apertures to be that which will increase the extraction power for the vacuum motor with which the base plate is utilized.

50. The process for enhancing removal of liquid from fabric as recited in claim 49, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

51. The process for enhancing removal of liquid from fabric as recited in claim 49, further comprising:

selecting the number and shape of the apertures to reduce the ratio of the total distance along all the perimenters of the apertures to the total cross-sectional area of the apertures.

52. The process for enhancing removal of liquid from fabric as recited in claim 51, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

53. A process for enhancing removal of liquid from fabric, which comprises:

applying a vacuum force to a base plate having one or more apertures to serve as extraction nozzles; and

selecting the number and shape of the apertures to reduce the ratio of the total distance along all the perimenters of the apertures to the total cross-sectional area of the apertures.

54. The process for enhancing removal of liquid from fabric as recited in claim 53, further comprising:

selecting the cross-sectional area of each of the apertures to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through the apertures without clogging the apertures.

ABSTRACT

A device for enhancing removal of liquid from fabric utilizing mechanical and aerodynamic techniques. A base plate contains one or more apertures to which a vacuum is applied for extracting water from the fabric. The total cross-sectional area of the apertures is selected to be that which will increase, and preferably maximize, the extraction power for the vacuum motor with which said base plate is to be utilized. The number and shape of the apertures is selected to reduce the ratio of the total distance along all the perimeters of said apertures to the total cross-sectional area of said apertures in order to reduce boundary layer drag. The cross-sectional area of each of said apertures is selected to be large enough to permit solid contaminants that can be expected to be in the liquid to pass through said apertures without clogging said apertures. Barriers are attached to the bottom of the base plate to force any liquid in the fabric toward the apertures as the base plate is moved across the fabric. And the construction of the barriers is such that each barrier has only a small surface area that will contact the fabric generally perpendicularly to the original orientation of such fabric. This last factor combines with the fact that apertures exist in the base plate, to increase the pressure created when a given force is applied to the Extraction Device and, therefore, to increase the penetration of the base plate of the Extraction Device into a fabric.

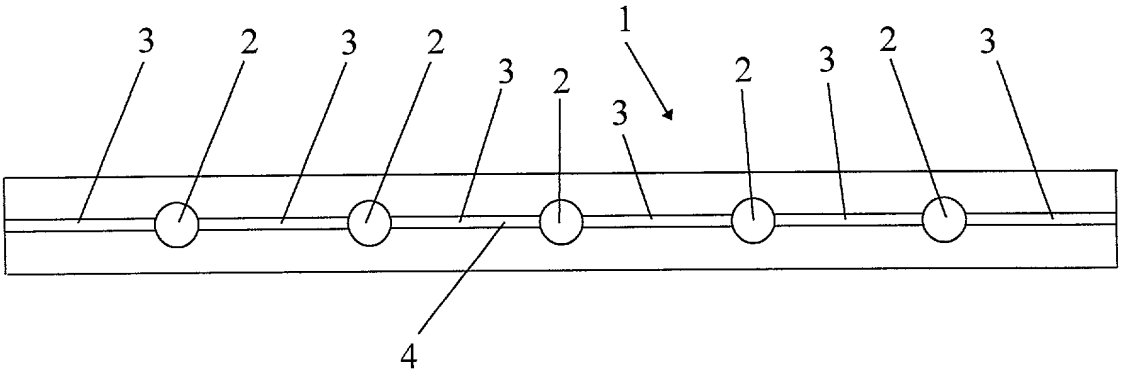

Figure 1

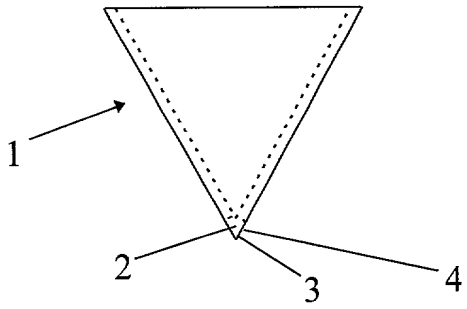

Figure 2

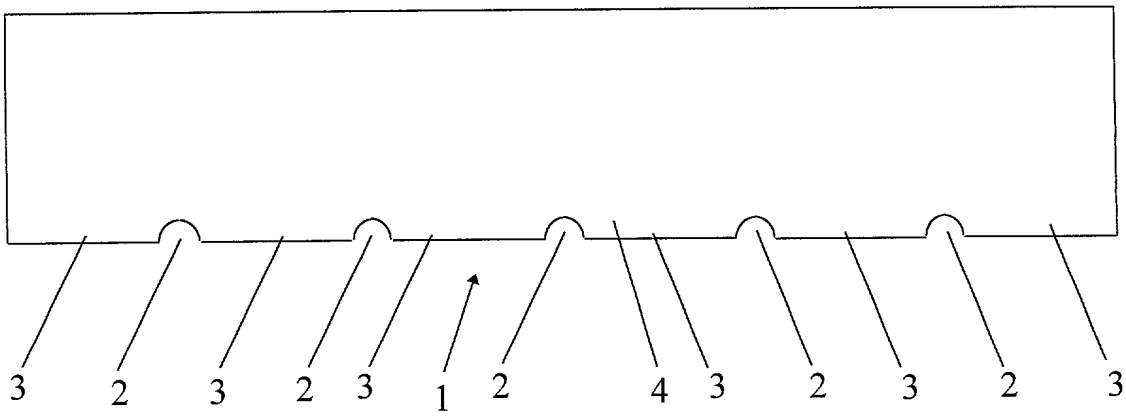

Figure 3

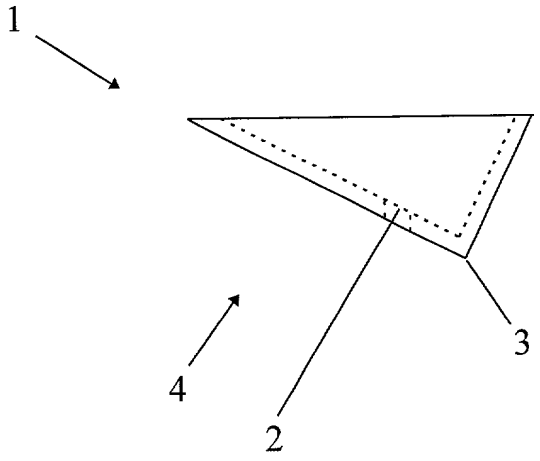

Figure 4

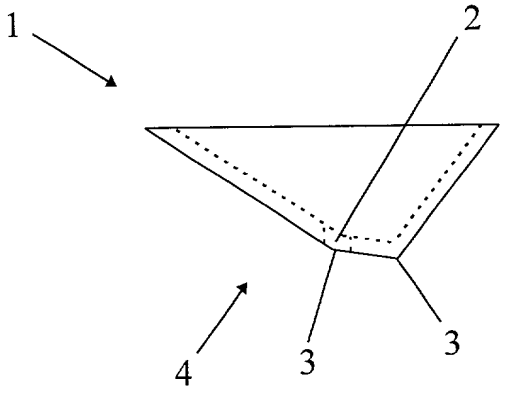

Figure 5

Express Mail Label No. EJ429149980US
Attorney's Docket No. PHRPIC

PATENT

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION OR C-I-P)

As a below-named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type: original.

INVENTORSHIP IDENTIFICATION

My residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first, and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

Device for Enhancing Removal of Liquid from Fabric

SPECIFICATION IDENTIFICATION

the specification of which is attached hereto.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 Code of Federal Regulations § 1.56.

PRIORITY CLAIM (35 U.S.C. § 119)

I hereby claim foreign priority benefits under Title 35 United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

No such applications have been filed.

CLAIM FOR BENEFIT OF EARLIER U.S. APPLICATION UNDER 35 U.S.C. 120

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, I acknowledge the duty to disclose information that is material to the examination of this application, namely, information where there is substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, which occurred between the filing date of the prior application(s) and the national filing date of this application.

No such applications have been filed.

POWER OF ATTORNEY

I hereby appoint the following attorney to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURES

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Inventor's signature Dan Haynie

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Residence: North Logan, Utah

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This declaration ends with this page.